What is claimed is:

1. A drill bit for drilling a wellbore, the drill bit comprising:

a drill bit body having at least one bearing;

a rotary cutter rotatably attached to the drill bit body at the bearing; and

a seal element positioned between the drill bit body and the rotary cutter, the seal element comprising a nanocomposite material.

2. The drill bit as recited in claim 1 wherein the seal element is selected from the group consisting of o-ring seals, d-seals, t-seals, v-seals, flat seals and lip seals.

3. The drill bit as recited in claim 1 wherein the nanocomposite material further comprises a polymer host material and a plurality of nanostructures.

4. The drill bit as recited in claim 3 wherein the polymer host material further comprises an elastomer.

5. The drill bit as recited in claim 4 wherein the elastomer is selected from the group consisting of NBR, XNBR, HNBR, HSN, EPR, EPDM, FEPM, FKM and FEKM.

6. The drill bit as recited in claim 3 wherein the nanostructures further comprise nanoparticles having a scale in the range of approximately 0.1 nanometer to approximately 500 nanometers.

7. The drill bit as recited in claim 3 wherein the nanostructures further comprise a material selected from the group consisting of metal oxides, nanoclays and carbon nanostructures.

8. The drill bit as recited in claim 3 wherein the nanostructures further comprise silicon.

9. The drill bit as recited in claim 3 wherein the nanostructures are selected from the group consisting of polysilane resins, polycarbosilane resins, polysilsesquioxane resins and polyhedral oligomeric silsesquioxane resins.

10. The drill bit as recited in claim 3 wherein the polymer host material and the nanostructures have interfacial interactions selected from the group consisting of copolymerization, crystallization, van der Waals interactions and cross-linking interactions.

11. A drill bit for drilling a wellbore, the drill bit comprising:

a drill bit body including a coupling that attaches to a drill string and a plurality of journal pins, each having a bearing surface;

a rotary cutter rotatably mounted on each journal pin, each rotary cutter including a bearing surface;

a pressure-compensated reservoir in fluid communication with the bearing surfaces having a lubricant therein; and

a seal element positioned between each journal pin and rotary cutter, the seal elements retaining the lubricant in the bearing surfaces, the seal elements comprising a nanocomposite material including a polymer host material and a plurality of nanostructures.

12. The drill bit as recited in claim 11 further comprising a diaphragm positioned within the pressure-compensated reservoir, the diaphragm comprising a nanocomposite material including a polymer host material and a plurality of nanostructures.

13. The drill bit as recited in claim 11 wherein the seal element is selected from the group consisting of o-ring seals, d-seals, t-seals, v-seals, flat seals and lip seals.

14. The drill bit as recited in claim 11 wherein the polymer host material further comprises an elastomer.

15. The drill bit as recited in claim 14 wherein the elastomer is selected from the group consisting of NBR, XNBR, HNBR, HSN, EPR, EPDM, FEPM, FKM and FEKM.

16. The drill bit as recited in claim 11 wherein the nanostructures further comprise nanoparticles having a scale in the range of approximately 0.1 nanometer to approximately 500 nanometers.

17. The drill bit as recited in claim 11 wherein the nanostructures further comprise a material selected from the group consisting of metal oxides, nanoclays and carbon nanostructures.

18. The drill bit as recited in claim 11 wherein the nanostructures further comprise silicon.

19. The drill bit as recited in claim 11 wherein the nanostructures are selected from the group consisting of polysilane resins, polycarbosilane resins, polysilsesquioxane resins and polyhedral oligomeric silsesquioxane resins.

20. The drill bit as recited in claim 11 wherein the polymer host material and the nanostructures have interfacial interactions selected from the group consisting of copolymerization, crystallization, van der Waals interactions and cross-linking interactions.

21. The drill bit as recited in claim 11 wherein the nanostructures further comprise carbon.

22. A drill bit for drilling a wellbore, the drill bit comprising:

a drill bit body including a coupling that attaches to a drill string and a plurality of journal pins, each having a bearing surface;

a rotary cutter rotatably mounted on each journal pin, each rotary cutter including a bearing surface;

a pressure-compensated reservoir in fluid communication with the bearing surfaces having a lubricant therein;

a diaphragm positioned within the pressure-compensated reservoir, the diaphragm comprising a nanocomposite material including a polymer host material and a plurality of nanostructures; and

a seal element positioned between each journal pin and rotary cutter, the seal elements retaining the lubricant in the bearing surfaces.

23. The drill bit as recited in claim 22 wherein the seal element comprising a nanocomposite material including a polymer host material and a plurality of nanostructures.

24. The drill bit as recited in claim 23 wherein the seal element is selected from the group consisting of o-ring seals, d-seals, t-seals, v-seals, flat seals and lip seals.

25. The drill bit as recited in claim 22 wherein the polymer host material further comprises an elastomer.

26. The drill bit as recited in claim 25 wherein the elastomer is selected from the group consisting of NBR, XNBR, HNBR, HSN, EPR, EPDM, FEPM, FKM and FEKM.

27. The drill bit as recited in claim 22 wherein the nanostructures further comprise nanoparticles having a scale in the range of approximately 0.1 nanometer to approximately 500 nanometers.

28. The drill bit as recited in claim 22 wherein the nanostructures further comprise a material selected from the group consisting of metal oxides, nanoclays and carbon nanostructures.

29. The drill bit as recited in claim 22 wherein the nanostructures further comprise silicon.

30. The drill bit as recited in claim 22 wherein the nanostructures are selected from the group consisting of polysilane resins, polycarbosilane resins, polysilsesquioxane resins and polyhedral oligomeric silsesquioxane resins.

31. The drill bit as recited in claim 22 wherein the polymer host material and the nanostructures have interfacial interactions selected from the group consisting of copolymerization, crystallization, van der Waals interactions and cross-linking interactions.

32. A method for lubricating a drill bit for drilling a wellbore, the drill bit including a drill bit body having at least one bearing and a rotary cutter rotatably attached to the drill bit body at the bearing, the method comprising the steps of:

introducing a lubricant into a pressure-compensated reservoir in fluid communication with the bearing; and

retaining the lubricant within the drill bit with a seal element comprising a nanocomposite material including a polymer host material and a plurality of nanostructures.

33. The method as recited in claim 32 further comprising the step of applying pressure from the exterior of the drill bit on the lubricant with a diaphragm comprising a nanocomposite material including a polymer host material and a plurality of nanostructures.

34. The method as recited in claim 32 wherein the step of retaining the lubricant within the drill bit with a seal element further comprises retaining the lubricant within the drill bit with a seal element selected from the group consisting of o-ring seals, d-seals, t-seals, v-seals, flat seals and lip seals.

35. The method as recited in claim 32 wherein the step of retaining the lubricant within the drill bit with a seal element further comprises selecting the polymer host material from the group consisting of elastomers.

36. The method as recited in claim 32 wherein the step of retaining the lubricant within the drill bit with a seal element further comprises selecting the polymer host material from the group consisting of NBR, XNBR, HNBR, HSN, EPR, EPDM, FEPM, FKM and FEKM.

37. The method as recited in claim 32 wherein the step of retaining the lubricant within the drill bit with a seal element further comprises selecting the nanostructures from nanomaterials having a scale in the range of approximately 0.1 nanometer to approximately 500 nanometers.

38. The method as recited in claim 32 wherein the step of retaining the lubricant within the drill bit with a seal element further comprises selecting the nanostructures from the group consisting of metal oxides, nanoclays and carbon nanostructures.

39. The method as recited in claim 32 wherein the step of retaining the lubricant within the drill bit with a seal element further comprises selecting the nanostructures from the group consisting of silicon based nanomaterials.

40. The method as recited in claim 32 wherein the step of retaining the lubricant within the drill bit with a seal element further comprises selecting the nanostructures from the group consisting of polysilane resins, polycarbosilane resins, polysilsesquioxane resins and polyhedral oligomeric silsesquioxane resins.